

Stable & Clean Power  
Worldwide



***PWM SERIES***  
*STATIC DIGITAL*  
*AC AUTOMATIC VOLTAGE STABILISER*  
***USER MANUAL***



**Thank you for purchasing a VSi PWM Series  
Static Digital AC Automatic Voltage Stabiliser**

# IMPORTANT

## PLEASE READ

This User / Operator Manual contains information concerning the safe and proper installation and operating procedures applicable to the PWM range of Single Phase Static Digital AC Automatic Voltage Stabilisers.

The Manual should be read in full before attempting to use, or operate the equipment.

If any problems are encountered with the procedures contained within this Manual then seek assistance from VSi or the distributor from whom you purchased the equipment.

Whilst every precaution has been taken to ensure the accuracy and completeness of this User Manual, VSi assumes no responsibility and disclaims all liabilities for damages resulting from misuse of this information or any error or omission.

### **Voltage Stabilisers International Limited**

**Tel:** +44 (0) 345 504 6324  
**Web:** <http://www.VSi.uk.com>

**Email**  
**Sales:** [Sales@VSi.uk.com](mailto:Sales@VSi.uk.com)  
**General:** [Info@VSi.uk.com](mailto:Info@VSi.uk.com)  
**Support:** [Support@VSi.uk.com](mailto:Support@VSi.uk.com)



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# 1. Introduction

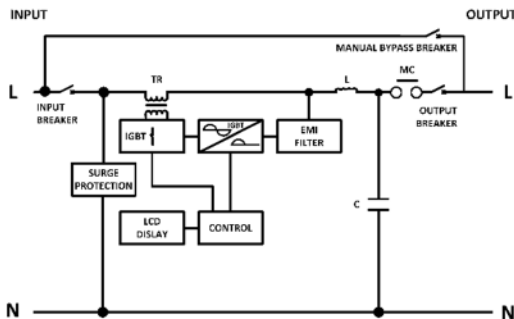
## 1.1 Overview

**PWM SERIES** microprocessor controlled Single Phase Static Digital Voltage Stabilisers automatically correct brownouts (by boosting low voltage) and over-voltages (by reducing high voltage). They are, designed to ensure the delivery of a stable and quality output voltage.

Being designed for many years of reliable service, VSi's **PWM** models provide protection from incoming line voltage sags, spikes and surges / swells. As Static Digital solutions they are virtually maintenance free and offer an exceptional fast speed of correction, making them ideal for the most sensitive of electrical and electronic loads.

## 1.2 Basic Principle of Operation

**PWM SERIES** AC Voltage Stabilisers are designed around a traditional well proven 'Buck / Boost' design topology, utilising the latest in IGBT Power Devices and digital PWM (Pulse Width Modulated) controls.



**Please Note:** **PWM** Voltage Stabilisers are **NOT FOR USE** with life sustaining equipment, or any device where the power requirements exceed the "Maximum Output Rating" listed in the General Specification tables. These Stabilisers are not designed to support / protect voltage "back feed" applications, where energy is required to be also fed back into the utility supply.

## 2. General Specification

### 2.1 Input

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
Input Voltages	220V - 230V - 240V AC Single Phase, 2 Wire (L, N & G/E)					
Voltage Range	230V $\pm$ 25% (173V to 287V) AC Single Phase, 2 Wire (L, N & G/E) (220V & 240V to Special Order)					
Max Input Current	13 Amps	21 Amps	32 Amps	42 Amps	63 Amps	84 Amps
Input Connectors	IEC 320 (16 Amp)	Hardwire				
Operating Frequency	50 / 60 Hz					

### 2.2 Output

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
Max Output Rating	2.1 kVA/kW	3.5 kVA/kW	5.5 kVA/kW	7.0 kVA/kW	10.5 kVA/kW	14.0 kVA/Kw
Output Voltage	230V $\pm$ 1%, Single Phase, 2 Wire (L, N & G/E) (220V & 240V to Special Order)					
Waveform	Sine Wave					
Output Connectors	2 x IEC320 (10 Amp)	Hardwire				
Harmonics	<3% of THD for Linear Load					
Speed of Correction	Ultra-Fast - Within 200 milliseconds (0.2 Seconds)					
Power Factor	No effect on performance providing the Stabiliser is being used within its rated capacity					
Frequency	50 / 60 Hz (what goes in comes out)					



## 2.3 Metering, Status Indicators, Alarms & Communication

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
Digital Metering	Input & Output Volts (V) Input & Output Frequency (Hz) Internal Temperature (°c) Load Current (Amps) Load Level Indicator (%)					
Status Indicators	Line, Normal, Bypass & Fault					
Audible Alarms	Fault & Over Voltage					
Comms	RS-232					

## 2.4 Protection

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
Over Current	Input & Output Breakers – as Standard					
Overload	More than 105% Output Automatically Disconnected – requiring Manual Restart					
Under & Over Voltage	Automatic Disconnect requiring Manual Restart (Output Under Limit 188V ±4V / Over Limit 270V ±4V)					
Over Voltage Surge Protection	MOV (Varistor)					
Noise Protection	EMI Filter					
Manual Bypass	NO	YES – inbuilt as Standard				



## 2.5 Environment

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
Operating Temp Range	0 to 40°C Derate by 2% for each additional °C up to a max. of 60 °C					
Maximum Altitude	2000 metres Derate by 1% for each additional 100 metres					
Relative Humidity	Suitable for indoor use up to 90% Relative Humidity (non-condensing).					
Audible Noise	<50 dBA (@1 Metre)					

## 2.6 Physical

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
Construction	Freestanding Enclosures to IP20 (NEMA 1 Style) - BS/EN 60529					
Colour	RAL 7047 (Telegray 4)					
Physical Size	258(W) x 333(H) x 422(D) mm				258 (W) x 546(H) x 532(D) mm	
Weight	23 Kg	29 Kg	30 Kg	32 Kg	58 Kg	62 Kg
Packed Size	38.1 (W) x 44.5(H) x 54(D) cm				40.2 (W) x 78(H) x 68(D) cm	
Packed Weight	25.5 Kg	31.5 Kg	32.5 Kg	34.5 Kg	68.5 Kg	72.5 Kg

## 2.7 Certification & Compliance

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
EMC Compliance	Complies with BS/EN 55022 & the relevant part of BS/EN 61000 Standards					
CE Certification	CE Marked – being fully compliant with European Union Directives 2014/30/EU (The EMC Directive) and 2014/35/EU (The Low Voltage Directive)					



## 2.8 Warranty

Model No	PWM 2.1H-S25	PWM 3.5H-S25	PWM 5.25H-S25	PWM 7H-S25	PWM 10.5H-S25	PWM 14H-S25
Standard Warranty	24 Months / 2 Years					





### 3. Safety Instructions



Read and follow all Safety Instructions

Please save these instructions for future reference

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#### 3.1 Introduction

These instructions are addressed to the installer and End User / Operator of the **PWM SERIES** of Single Phase Static Digital AC Voltage Stabilisers. We strongly suggest you keep this manual next to the equipment for future reference.

#### 3.2 General Installation & Usage

Do not use the Stabiliser for other than the intended use.

Do not install Stabiliser in back feed circuits, such as solar panel and wind turbine applications, where the energy is supplied back to the grid, nor should the input voltage supply be connected to the output of stabiliser.

If on delivery there is evidence of visible damage, do not attempt to install or start the Stabiliser. Advise the transport delivery company and inform VSi, or the resale partner from whom you purchased the equipment.

The Stabiliser can contain potentially dangerous voltages – up to 300V AC. As there are no user replaceable components, once installed there should be no reason to remove the protective covers. If the covers are removed, use extreme caution and do not leave the unit unattended with the covers off.

Hazardous voltages can be present at the unit's output any time AC input power is applied. To avoid possible personal injury, or equipment damage, and to make certain there is no output voltage, turn the unit off and disconnect the AC Input.

To reduce the risk of fire, or electrical shock, install the unit in an indoor area free from conductive contaminants.



Do not use outdoors.

Do not place the unit near water or liquids, gas and combustible materials or in an excessively humid environment where condensation is very likely to occur.

To reduce the risk of overheating, do not block the unit's ventilation panels and try to avoid positioning the unit in direct strong sunlight or close to other heat sources.

Do not allow liquids or foreign object to enter the unit.

The installation and use of this product must comply with all relevant current electrical installations that are in force in the territory of installation.

Where the system is required to be hardwired into the input utility mains supply we would strongly suggest that a qualified electrician should install the equipment. The electrician should install the AC input accordingly to the instructions contained in this manual. Standard safety practices should be followed at all times.

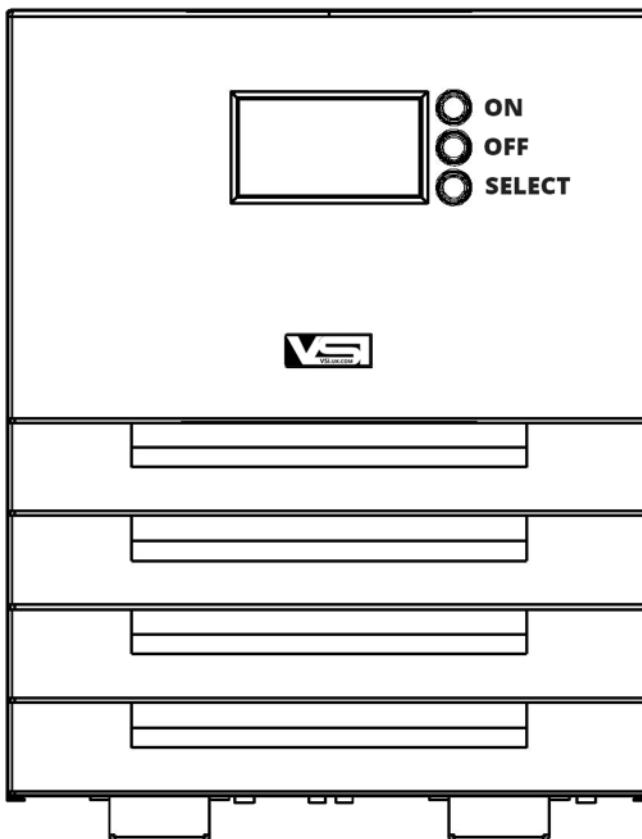
The unit must be grounded / earthed at all times when in use.



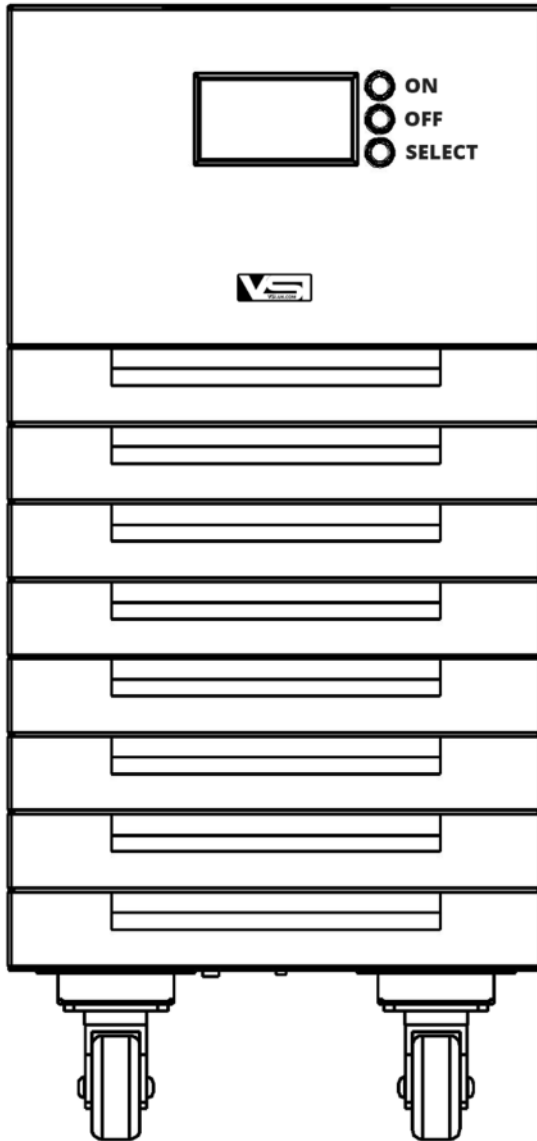
## 4. Visual External Appearance

### 4.1 Front View

#### 4.1.1 Model: PWM-2.1H-S25 to PWM-7H-S25

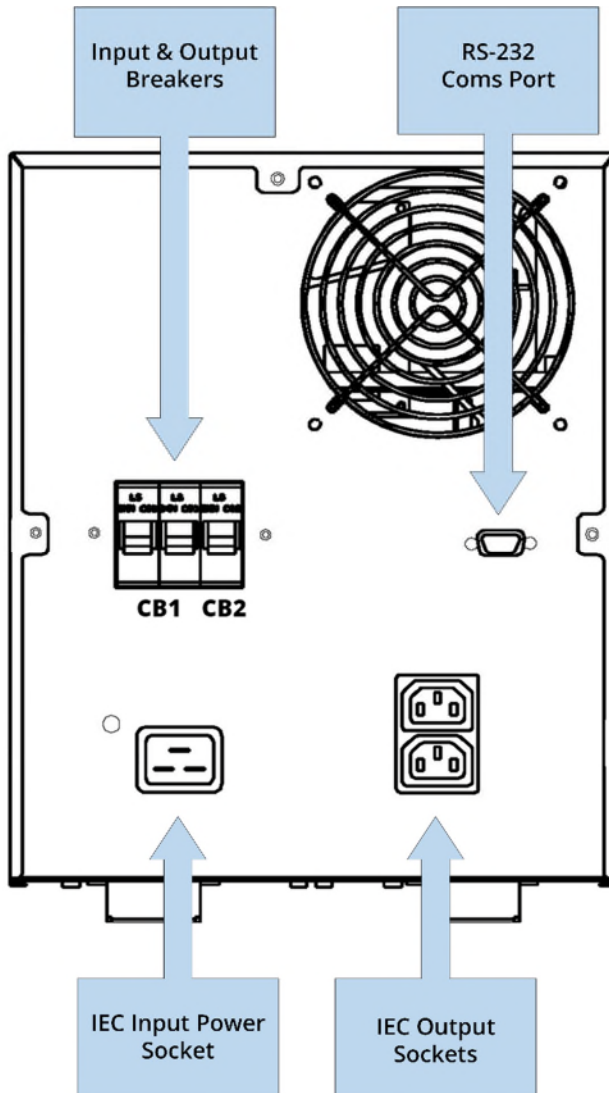


#### 4.1.2 Model: PWM-10.5H-S25 to PWM-14H-S25

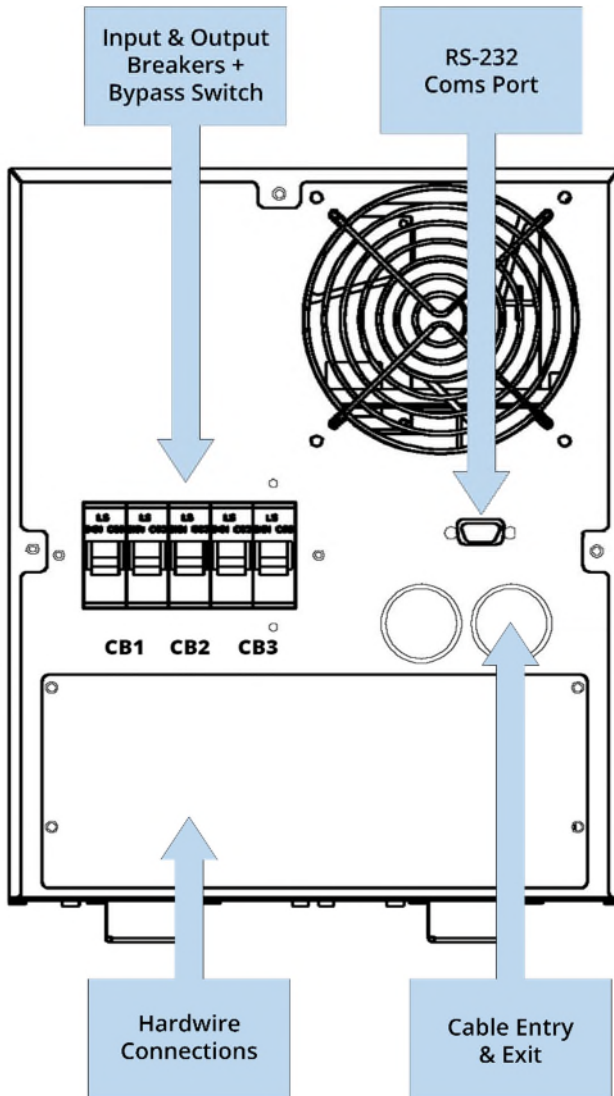


## 4.2 Rear View

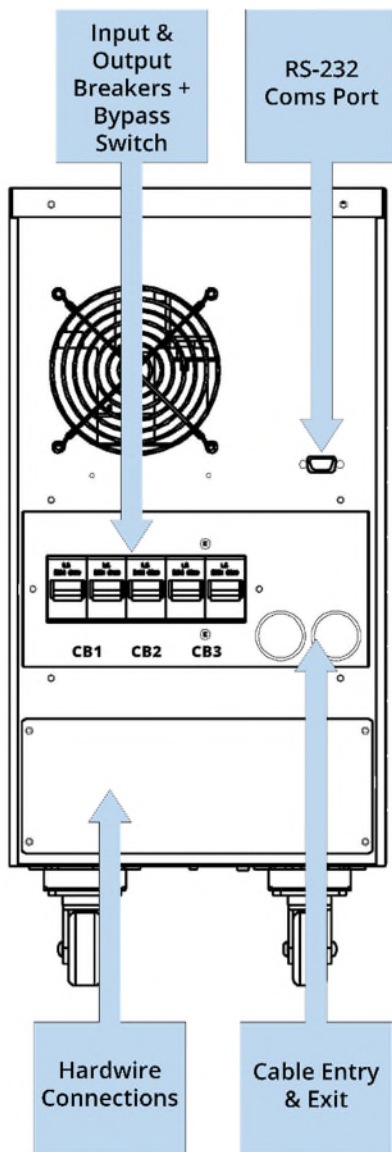
### 4.2.1 Model: PWM-2.1H-S25



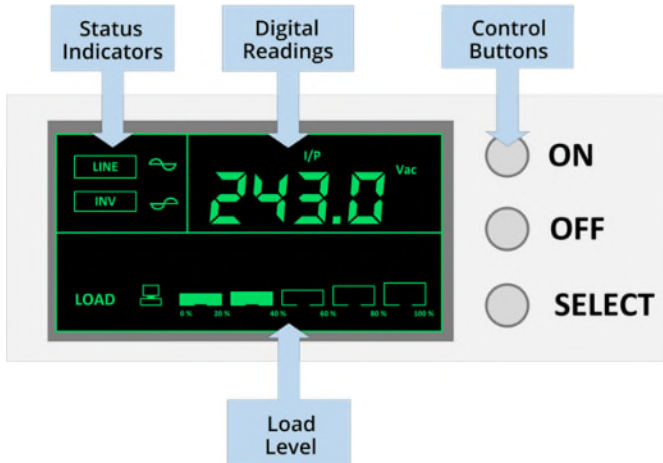
#### 4.2.2 Model PWM-3.5H-S25 – PWM-7H-S25



### 4.2.3 Model PWM-10.5H-S25 – PWM-14H-S25 (on Castors)



## 4.3 Front Display Panel



In normal running mode both the 'LINE' and 'INV' Status Indicators should be illuminated.

### 4.3.1 Status Indicators

**LINE**

All Okay – in line mode

**BYPASS**

In Bypass Mode

**INV**

Stable Output Voltage

**FAULT**

Output Overload or an Abnormal Condition exists



### 4.3.2 Digital Metering

Press and hold down the 'SELECT' Control Button for 1.5 seconds to change the displayed reading.

Holding down the 'SELECT' Control Button will enable an automatic rotation of the available readings.

Releasing the 'SELECT' Control Button will stop the rotation at the required reading.

#### Available Readings are

<b>Input Voltage</b> (I/P Vac)	Voltage level of the incoming utility mains supply
<b>Output Voltage</b> (O/P Vac)	Output Voltage delivered by the system.
<b>Input Frequency</b> (I/P Hz)	Frequency of the incoming utility mains supply
<b>Output Frequency</b> (O/P Hz)	Output Frequency delivered by the system.
<b>Load Current</b> (O/P)	Power (Amps) drawn by the connected load.
<b>Temperature</b> (°C)	Internal Temperature of the system

**Please Note:** The multifunctional display is for indication purposes only and may not display the exact voltage and current readings as seen by a calibrated multi-meter, but should be within an accuracy of  $\pm 5\%$ .

### 4.3.3 Load Level Indication



In addition to load current readings the display panel also shows below the digital metering in the form of a bar graph percentage load readings.

## 5. Installation & Operation Instructions

### 5.1 Unpacking & inspection

If on delivery there is evidence of visible damage, do not attempt to install or start the Stabiliser. Advise the transport delivery company and inform VSi, or the resale partner from whom you purchased the equipment.

After unpacking and removing the polystyrene protective packaging from the *PWM SERIES* unit, inspect the ventilation slots to ensure that they are free from all obstruction. Use a vacuum cleaner to dislodge any obstructions.

We would suggest you retain the packing carton and packaging material to return the *PWM SERIES* Stabiliser in the unlikely event of its operational failure.

### 5.2 Positioning

Although the Stabiliser does not produce excessive heat, you should ensure that it is positioned so that a free flow of air allows the unit to cool. To reduce the risk of overheating, do not block the unit's ventilation panels and try to avoid positioning the unit in direct strong sunlight or close to other heat sources.

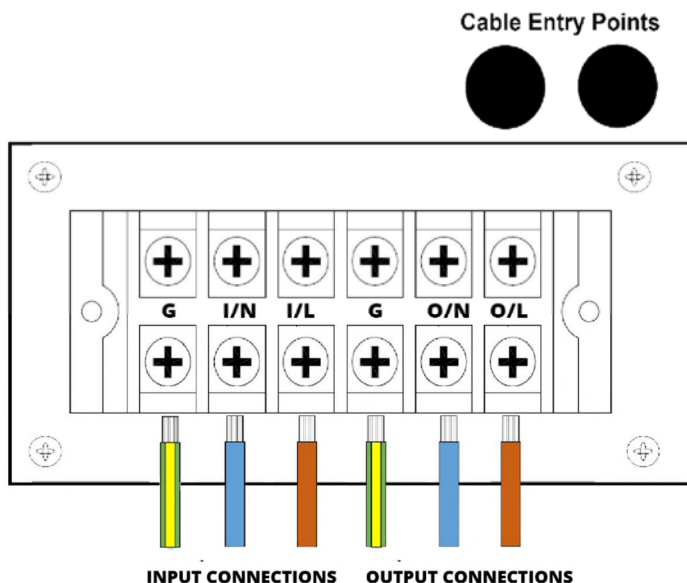
The Stabiliser is intended for indoor use only. Do not install inside a closed cupboard and do not allow papers, or other materials, to be piled on top of the enclosure.

Do not place the unit near water or liquids, gas and combustible materials or in an excessively humid environment where condensation is very likely to occur.



## 5.3 Hardwire Installation

### Models PCM-3.5H-S25 to PCM-14H-S25



- Remove Terminals Connection Cover Plate.
- Ensure supply is isolated before making connections.
- Connect the Input Cable to the terminal block (as indicated) and take to mains supply via cable entry access hole in the enclosure.
- Connect the Output Cable to the terminal block (as indicated) and take to the load via the relevant cable access hole in the enclosure.
- Check all wires are properly secured (using glanding – as appropriate), connections are tight and cables are correctly wired before switching on.
- Refit Terminals Connection Cover Plate

### Please Note:

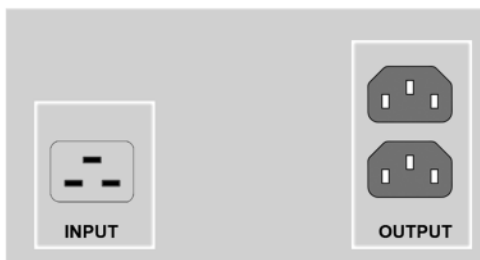
If you are unfamiliar with installing electrical equipment, prior to installing the Stabiliser, please consult with a qualified electrician.

Also with cable connections –

- The wire coloured **BROWN** must be connected to the terminal marked 'L' for Live
- The wire coloured **BLUE** must be connected to the terminal marked 'N' for Neutral.
- The wire coloured **YELLOW** and **GREEN** must be connected to the terminal marked 'G' for Earth / Ground.

## 5.4 Plug N Play Installation

### Model PCM-2.1H-S25



- To ease installation, given the model's maximum input and maximum output current ratings, the Voltage Stabiliser is fitted instead with standard IEC input (16 Amp) and output sockets (10 Amps).
- To install simply utilise a standard 16 Amp IEC Input Cable to connect the utility mains supply and 10 Amp IEC Output power cables to connect the load.

## 5.5 Normal Operation

### 5.5.1 Power Up

Without any connected load.

1. Switch **CB 1** (Input Breaker) to the 'ON' position. Buzzer will sound for approximately 2.5 seconds while the system runs through a self-diagnostic testing routine.

Initially the 'LINE' Status Indicator on the Front Panel will illuminate. When the self-diagnostic testing routine has satisfactorily completed the 'INV' Status Indicator will light up.

2. Switch **CB 2** (Output Breaker) to the 'ON' position.
3. Press the 'ON' Button next to the Front Display for 2 seconds. Front Display will activate.

Stabiliser should now be operational, able to support / have load connected.

*It is recommended that you check the output voltage with a True RMS Voltmeter to ensure that the correct output voltage is displayed.*

*If the correct voltage is not measured by the multi-meter please advise the resale partner / dealer you purchased the stabiliser from, or your nearest VSi office. Please ensure you advise your support teams of the model, serial number and where you purchased the stabiliser from.*

### 5.5.2 Power Down

Switch off any connected load.

1. Switch **CB 2** (Output Breaker) to the 'OFF' position.
2. Press the 'OFF' Button next to the Front Display for 2 seconds. Front Display will deactivate.

*While it may appear the stabiliser is fully powered down do not attempt to remove any side panels from the stabiliser as internally power will still be present until you complete the next step below.*



3. Switch CB 1 (Input Breaker) to the 'OFF' position.

Stabiliser should now be safely powered down.

## 5.6 Manual Bypass Operation

Only available on models PCM-3.5H-S25 to PCM-14H-S25



**Incorrect switching may seriously damage the Stabiliser /and or connected Load Equipment -  
*Invalidate any Warranty***

### 5.6.1 Turning On

Please ensure all load equipment is switched off before commencing any of these procedures.

1. Switch **CB 2** (Output Breaker) to the 'OFF' position.
2. Switch **CB 1** (Input Breaker) to the 'OFF' position.
3. Remove the **CB 3** (Bypass Switch) Cover Plate.
4. Switch **CB 3** (Bypass Switch) to the ON position.

The load is now supplied by the unregulated utility mains supply.

### 5.6.2 Turning Off

1. Switch CB 3 (Bypass Switch) to the OFF position.
2. Reattach the CB 3 (Bypass Switch) Cover Plate.

Stabiliser should now be ready for Power Up.

## 6. Troubleshooting

Symptom	Possible Cause	Remedy
Display 'LINE' indicator is not illuminated	<ol style="list-style-type: none"> <li>1) Extremely irregular power being is being supplied from the utility mains supply.</li> </ol>	<p>Ensure the level of the input voltage is within the permissible input voltage window of the stabiliser.</p> <p>Switch off all Breakers then try re-starting the Stabiliser by following the Start-up procedure.</p> <p>If the 'LINE' indicator still does not illuminate please seek advice from the dealer from whom the stabiliser was purchased, or get in touch with your local VSi Support Centre.</p>
Display 'FAULT' indicator is illuminated.	<ol style="list-style-type: none"> <li>1) System is overloaded.</li> <li>2) Output Voltage exceeds <math>\pm 18.18\%</math>.</li> <li>3) Another Abnormal Fault condition is present.</li> </ol>	<p>Reduce the load.</p> <p>Restart the Stabiliser.</p> <p>Follow the power down sequence, pause and then try re-starting the Stabiliser following the Power up sequence.</p> <p>If the 'FAULT' indicator is still illuminated please seek advice from the dealer from whom the Stabiliser was purchased, or get in touch with your local VSi Support Centre.</p>



Symptom	Possible Cause	Remedy
<p>There is no output voltage</p>	<ol style="list-style-type: none"> <li>1) The utility mains supply is not present.</li> <li>2) <b>CB 2</b> is switched off.</li> <li>3) System has automatically tripped and requires a manual restart</li> </ol>	<p>Ensure that the input supply is present.</p> <p>If present and within the permissible input voltage tolerance window, shut down the Stabiliser as per the instructions in Section 5.5.2 of this Manual. Wait 10 seconds then restart following closely the instructions given in Section 5.5.1.</p> <p>If still no output voltage is present, for models, with a Manual Bypass, put the system in Manual Bypass by following the instructions given in <b>Section 5.6</b> and seek advice from the dealer from whom the Stabiliser was purchased, or get in touch with your local <b>VSi</b> Support Centre.</p>



Symptom	Possible Cause	Remedy
Display 'INV' Indicator is not illuminated.	<p>Output Voltage is not Stable.</p> <ol style="list-style-type: none"> <li>1) Input Voltage has exceeded the permissible input voltage window.</li> <li>2) System is on automatic Bypass or in Manual Bypass Mode.</li> </ol>	<p>Check input voltage and ensure voltage is within the permissible window.</p> <p>Clear the reason for the system being on automatic bypass and if appropriate turn off the Manual Bypass, following the instructions given in <b>Section 5.6</b>.</p> <p>If the unstable output voltage condition still exists, please seek advice from the dealer from whom the Stabiliser was purchased, or get in touch with your local <b>VSi</b> Support Centre.</p>
Display 'BYPASS' indicator is illuminated.	<ol style="list-style-type: none"> <li>1) Actual load current exceeds the model's stated maximum rating.</li> </ol>	<p>Reduce the loading on the unit. On overload clearance the system should automatically re-engaged the inverter to deliver a stable output voltage.</p> <p>If you are unable to clear the Bypass indicator, please seek advice from the dealer from whom the Stabiliser was purchased, or get in touch with your local <b>VSi</b> Support Centre.</p>

Symptom	Possible Cause	Remedy
<p>LCD Display is not operational.</p>	<p>1) Incoming utility mains supply is not present and / or CB 1 is not in the ON position.</p>	<p>Check to ensure mains supply is present and <b>CB 1</b> is switched '<b>ON</b>'.</p> <p>If the display is still not operational, please seek advice from the dealer from whom the Stabiliser was purchased, or get in touch with your local VSi Support Centre.</p>



## 7. Warranty & Returns

### 7.1 Warranty

VSi (UK) warrants its products to be free from defect in materials and workmanship for a period of two (2) years from the date of purchase.

The obligation under this warranty is limited to repairing or replacing, at VSi's sole discretion, any such defective products.

The warranty does not apply if the product has been damaged by accident, negligence, or misapplication or has been altered or modified in any way.

Except as provided herein, VSi makes no warranties, expressed or implied, including warranties or merchantability and fitness for a particular purpose.

Some counties do not permit limitation or exclusions of implied warranties; therefore, the aforesaid limitation(s) or exclusions(s) may not apply to the purchaser.

Except as provided above, in no event shall VSi be liable for direct, indirect, special, incidental, or consequential damages arising out of the use of this product, even if advised of the possibility of such damage. Specifically, VSi is not liable for any costs, such as lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, cost of substitutes, claims by third parties, or otherwise. This warranty gives you specific legal rights and you may also have other rights which may vary from location to location.

This warranty does not affect your statutory or Common Law rights.



## 7.2 Returns Procedure

Should your **PCM SERIES** Stabiliser need repair, the quickest and simplest way is to return it to the resale partner / dealer you purchased it from or direct to your nearest **VSi** office.

### **Important:**

Before returning a product to **VSi**, please contact the After Sales Support Department to obtain a Returns Number and to be advised of the nearest and most appropriate Service Centre to which you should send the goods.

### **VSi - After Sales Support**

Email Support:            support@VSi.uk.com  
Tel:                            + 44 (0) 345 504 6324  
Web:                          https://www.VSi.uk.com

At the time of your request please note you will be asked to provide the following information: -

- Your Name, Company Names, Address, Telephone No & Email Address
- Date of Purchase, Where & From Whom it was Purchased
- Serial No & Model No
- Local Voltage & Type of Load Connected
- A Description of the Fault

Once you have the Returns Number and Shipping Address you should ensure that the unit is securely packed (*ideally in the packing carton the Stabiliser was originally supplied*). It is imperative that you ensure that the Returns Number is clearly shown on the packing carton and also a note is added to the box to advise where and to whom the stabiliser should be returned to after its repair or replacement.

Kindly ensure that all products returned to **VSi** are done on a transportation repaid basis.

**Complying with the above will ensure that you're Stabiliser will be treated promptly and efficiently, without a Returns Number it will not be possible trace a unit or check progress on the repair of the item.**



**Notes:**



**Notes:**





[www.VSi.UK.COM](http://www.vsi.uk.com)

